

Claims

1. A magnetic bearing apparatus comprising: a rotatable rotary member in which a radial magnetic bearing rotor and an axial magnetic bearing disc are secured to a rotary shaft; electromagnets that are arranged around said rotary member via a small gap; and a case housing them, wherein

said apparatus further comprises: cooling wind producing means for producing cooling wind of a low temperature with using a driving force of said rotary member; and a cooling wind flow path through which the low-temperature cooling wind produced by said cooling wind producing means is to flow into said magnetic bearing apparatus.

2. A magnetic bearing apparatus according to claim 1, wherein said cooling wind producing means comprises: high-speed air flow producing means for producing a high-speed air flow with using the driving force of said rotary member; converting means for converting the high-speed air flow produced by said high-speed air flow producing means, to a vortex flow; an air flow path through which the high-speed vortex flow converted by said converting means is to flow; and a control valve which is disposed on a side of said air flow path opposite to said converting means.

3. A magnetic bearing apparatus comprising: a rotatable rotary shaft to which a radial magnetic bearing rotor and an axial magnetic bearing disc are secured; electromagnets which

are arranged with forming a small gap with respect to said radial magnetic bearing rotor and said axial magnetic bearing disc; and a case housing them, wherein

    said apparatus further comprises: cooling wind producing means that produces cooling wind of a low temperature, and that has: fins which are disposed on said rotary shaft, and which produces an axial air flow by a driving force of said rotary shaft; a generator which is fixed with forming a predetermined gap with respect to said fins, and which produces a high-speed vortex flow; a tube through which the high-speed vortex flow produced by said generator is to flow; and a control valve which is disposed on a side of said tube opposite to said generator; and a cooling wind flow path through which the low-temperature cooling wind produced by said cooling wind producing means is to flow into said magnetic bearing apparatus.

4. A magnetic bearing apparatus according to claim 3, wherein said cooling wind flow path is disposed in said rotary shaft portion so as to axially elongate.

5. A magnetic bearing apparatus according to claim 3 or claim 4, wherein said cooling wind flow path has: a cooling wind flow path disposed in said case; and a pipe which guides the low-temperature cooling wind to said cooling wind flow path disposed in said case.

6. A magnetic bearing apparatus comprising: a rotatable rotary shaft to which a radial magnetic bearing rotor and an

axial magnetic bearing disc are secured; electromagnets which are arranged with forming a small gap with respect to said radial magnetic bearing rotor and said axial magnetic bearing disc; and a case housing them, wherein

said apparatus further comprises: cooling wind producing means that produces cooling wind of a low temperature, and that has: fins which are disposed on said axial magnetic bearing disc, and which produces an air flow directed in an outer radial direction of said axial magnetic bearing disc; a supply port which is positioned in an outer circumferential portion of said fins, and through which the air flow produced by said fins is introduced and ejected as a high-speed air flow in the outer radial direction; a generator which converts the high-speed air flow ejected from said supply port, to a vortex flow; an air flow path through which the high-speed vortex flow produced by said generator is to flow; and a control valve which is disposed on a side of said air flow path opposite to said generator; and a cooling wind flow path through which the low-temperature cooling wind produced by said cooling wind producing means is to flow into said magnetic bearing apparatus.

7. A magnetic bearing apparatus according to claim 6, wherein a guide portion which guides the low-temperature cooling wind to a rotary shaft portion is disposed.

8. A magnetic bearing apparatus according to claim 6, wherein said cooling wind flow path has: a cooling wind flow

path which is disposed in said case, and through which the low-temperature cooling wind produced by said cooling wind producing means is to flow; a guide plate which guides the cooling wind that has been passed through said cooling flow path, to a rotary shaft portion; and a cooling wind flow path which is disposed in said rotary shaft portion, and through which the cooling wind that has been guided by said guide plate is to axially flow, thereby cooling said rotary shaft portion.

9. A magnetic bearing apparatus comprising: a rotatable rotary shaft to which a radial magnetic bearing rotor and an axial magnetic bearing disc are secured; electromagnets which are arranged with forming a small gap with respect to said radial magnetic bearing rotor and said axial magnetic bearing disc; and a case housing them, wherein

said apparatus further comprises: cooling wind producing means that produces cooling wind of a low temperature, and that has: fins which are disposed on said axial magnetic bearing disc, and which produces an air flow directed in an outer radial direction of said axial magnetic bearing disc; a supply port which is positioned in an outer circumferential portion of said fins, and through which the air flow produced by said fins is introduced and ejected as a high-speed air flow in the outer radial direction; an air flow path through which the high-speed air flow ejected from said supply port is to flow; a generator which converts the high-speed air flow ejected from said air

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flow path, to a vortex flow; a tube through which the high-speed vortex flow produced by said generator is to flow; and a control valve which is disposed on a side of said tube opposite to said generator; and a cooling wind flow path through which the low-temperature cooling wind produced by said cooling wind producing means is to flow into said magnetic bearing apparatus.